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Indian Standard

LETTER SYMBOLS AND SIGNS USED IN ELECTRICAL TECHNOLOGY

PART 2 REFERENCE TABLES FOR SYMBOLS AND SUBSCRIPTS

(First Revision)

UDC 621·3·011 : 003·62

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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June 1984

Indian Standard

LETTER SYMBOLS AND SIGNS USED IN ELECTRICAL TECHNOLOGY

PART 2 REFERENCE TABLES FOR SYMBOLS AND SUBSCRIPTS

(*First Revision*)

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(*Continued on page* 2)

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LETTER SYMBOLS AND SIGNS USED IN ELECTRICAL TECHNOLOGY

PART 2 REFERENCE TABLES FOR SYMBOLS AND SUBSCRIPTS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) (Part 2) was adopted by the Indian Standards Institution on 30 May 1983, after the draft finalized by the Basic Electrotechnical Standards Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Quantities and units used in electrical technology cover, in addition to electricity, magnetism, radiation and light, other subjects such as geometry, kinematics, dynamics and thermodynamics. As technology reaches greater levels, several disciplines interact with the result that terminology used in one discipline becomes closely interrelated with that of the other. The letter symbols, used in abbreviations for denoting quantities, their functions and units, therefore, would have to be standardized in order to enable uniform understanding of the meaning they represent.

0.3 Realising the need, this standard was originally brought out in 1966 essentially to cover symbols for quantities and units. The present revision is being brought out with a wider scope, including rules for subscripts, rules for denoting numerical values etc. This revision for ease of reference, is being brought out in two parts:

Part 1 General guidance on symbols and subscripts

Part 2 Reference tables for symbols and subscripts

It is felt that while Part 1 essentially would provide guidance on choice of symbols and subscripts with the associated logic, Part 2 would serve as a ready reference on the various quantities and units. These Parts shall, therefore, be read in conjunction with each other.

0.4 In this standard the units are given in the SI units (the International System of Units). This system is based on the following six basic units:

metre (m)	ampere (A)
kilogram (kg)	kelvin (k)
second (s)	candela (cd)

as units for the basic quantities of length, mass, time, electric current, temperature, and luminous intensity. For some of the quantities, like conductance and magnetic flux density, the units are given, besides in SI units, also in more familiar units in use in the country. However, it should be noted that the latter units are not necessarily equivalent to the SI units.

0.5 In the preparation of this standard, considerable assistance has been derived from IEC Pub 27-1(197 1) 'Letter symbols to be used in electrical technology : Part I General', issued by the International Electrotechnical Commission.

1. SCOPE

1.1 This standard covers letter symbols and signs for quantities used in electrical technology and their units.

1.2 This standard (Part 2) covers reference tables for symbols for quantities and their units, constants, methematical signs and symbols and recommended subscripts.

2. INTRODUCTION TO TABLES

2.1 The tables in the following pages include in addition to certain symbols used in electricity and magnetism, some other symbols that occur in electrical technology.

2.2 In Table 1 the vectorial or tensorial character of certain quantities or their complex representation are disregarded.

2.3 The first column of symbols for quantities in Table 1 gives the chief symbols. The second column gives reserve symbols for use where a chief symbol is found unsuitable, for instance where its use would lead to confusion with the same symbol used with a different significance.

2.4 Names are used only for identification, and generally agree with IS : 1885*.

---

* Electrotechnical vocabulary (*issusd in several parts*).

2.5 Wherever the symbol for the unit is 1, the corresponding quantity is a numeric and its value is written as a number without the unit symbol. Wherever the name of a unit is of the form '1 per metre', quantities are expressed in the form 'x per metre' where x is the numerical value, for example, 5 per metre.

2.6 Rules for the choice of subscripts are given in IS : 3722 (Part 1)-1983*. Subscripts shall conform to these rules, but even when they do, a choice between different subscripts for the same purpose is not precluded. As a help towards standardizing the choice, a list of subscripts recommended for various purposes is given in the Table 4. These subscripts are recommended for use irrespective the language of the text in which the symbols appear.

2.7 Letter symbols for quantities or units are recommended for use as subscripts whenever applicable, and since these are well known and internationally understood they have not been specifically listed here.

2.8 The subscripts specified in Table 4 are given in a list divided into groups with some more or less discernible relationship within each group. The order between the groups and within the groups is not significant. In general, a short form and a long form of subscript is given for each item. The long form is intended to be less ambiguous than the short one.

2.9 In the last column of Table 4 the language source is indicated by 'L' for Latin, 'G' for Greek, 'E' for English, and 'F' for French. If there are many sources for the same subscript, in general only one is mentioned.

3. ALPHABETICAL LISTS

3.1 Alphabetical lists of symbols, and names of quantities, constants and subscripts, corresponding to Tables 1 to 4 are given in Appendices A, B, C and D for the purpose of easy reference.

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*Letter symbols and signs used in electrical technology: Part 1 General guidance on symbols and subscripts (*first revision*).

TABLE 1 SYMBOLS FOR QUANTITIES AND THEIR UNITS

Item No	Quantities				Units				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI unit		Some Other Units or Designations		Remarks
					Name	Symbol	Name	Symbol	
	Geometry and Kinematics								
1	Angle (plane angle)	α, β, γ		Other suitable letters of the Greek alphabet can also be used as chief symbols. For identifying an angle of rotation, the symbols Θ and ϑ are recommended	radian	rad	degree minute second	...° ...′ ...″	*see* Note 1
2	solid angle	Ω	ω		steradian	sr			
3	length	l			metre	m			
4	breadth	b			metre	m			
5	height, depth	h			metre	m			
6	thickness	d, δ			metre	m			
7	radius, radial distance	r			metre	m			

8	diameter	d			metre	m			
9	length of path, line segment	s			metre	m			
10	wavelength	λ			metre	m			
11	area, surface area	A	S		square metre	m^2			
12	volume	V	v		cubic metre	ma			
13	time	t			second	s	minute hour	min h	
14	time of one cycle, period	T			second	s			
15	time constant	τ	T		second	s			
16	frequency	f	ν		hertz	HZ	cycle per second abbreviation c/s		
17	rotational frequency	n		see Note 2	1 per second	s^{-1}	see Note 2		*see* Note 4
18	slip	s	g			1	percent	%	
19	angular frequency	ω		$\omega = 2\pi f$	radian per second	rad/s			*see* Note 3
20	angular velocity	ω	Ω		radian per second	rad/s	*see* Note 2		
21	angular acceleration	α			radian per square second	rad/s^2			
22	speed (linear), velocity	v			metre per second	m/s			

(*Continued*)

TABLE 1 SYMBOLS FOR QUANTITIES AND THEIR UNITS — *Contd*

Item No.	Quantities				Units				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI Unit		Some Other Units or Designations		Remarks
					Name	Symbol	Name	Symbol	
23	velocity (speed) of propagation of electromagnetic waves	c		in **vacuo** c_0, see Table 2	metre per second	**m/s**			
24	(linear) acceleration	a		$a = dv/dt$	metre per square second	**m/s^2**			
25	acceleration of free fall	g		sometimes called acceleration due to gravity	metre per square second	**m/s^2**			
26	damping coefficient	δ			1 per second	s^{-1}			*see* Note 4
27	attenuation coefficient	α			**1 per metre**				see Note 5
28	phase coefficient	β	b		radian per metre	**rad/m**			
29	propagation coefficient	γ	p	$\gamma = \alpha + j\beta$	in general, units are used only with α and β				

					Dynamics				
30	mass	m			kilogram	kg			
31	density (mass density)	ρ	ρ_m	mass divided by volume	kilogram per cubic metre	kg/m^3			
32	momentum	p		product of mass and velocity	kilogram metre per second	kg.m/s			
33	(dynamic) moment of inertia	I, J			kilogram square metre	kg. m^2			
34	force	F			newton	N	dyne	dyn	
35	weight	G	P, W	varies with acceleration of free fall	newton	N	kilogram-force **kgf**	dyn	*See* Note 6
36	weight density (specific weight)	γ		weight divided by volume	newton per cubic metre	N/m^3			
37	moment of force	M			newton metre	N.m			
38	torque	T			newton metre	N.m			
39	pressure	p			pascal	Pa	bar	bar	
40	work	W	A		joule	J			
41	energy	E, W		U is recommended in thermodynamics for internal energy and for black body radiation energy	joule	J	erg kilowatt hour electron-volt	erg kWh eV	

(*Continued*)

TABLE 1 SYMBOLS FOR QUANTITIES AND THEIR UNITS – *Contd*

ITEM No.	QUANTITIES				UNITS				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI Unit		Some Other Units or Designations		Remarks
					Name	Symbol	Name	Symbol	
42	energy (volume) density	w			joule per cubic metre	J/m^3			
43	power	P		*see* Items 99, 100 and 101	watt	W			
44	efficiency	η				1	percent	%	
	Thermodynamics								
45	thermodynamic temperature, absolute temperature	T	Θ		kelvin	K			
46	temperature (Celsius)	t, ϑ, θ			degree Celsius	°C			*see* Note 7
47	heat, quantity of heat	Q			joule	J			
48	temperature coefficient	α		a temperature coefficient is not defined unless the quantity that	1 per kelvin	K^{-1}			

				changes is specified, for example, resistance, length, pressure); the pressure (temperature) coefficient is designated by β, the cubic expansion (temperature) coefficient by α, β or γ					
49	thermal conductivity	λ	*k*		watt per metre kelvin	$\frac{W}{m.K}$			
50	heat capacity	C			joule per kelvin	J/K			
51	specific heat capacity	*c*		heat capacity divided by mass; the term ‘ specific heat ’ is deprecated	joule per kilogram kelvin	$\frac{J}{kg.K}$			
Electricity and Magnetism									
52	(electric) charge, quantity of electricity	Q			coulomb	C	ampere hour	Ah	
53	surface density of charge	σ			coulomb per square metre	C/m^2			
54	volume density of charge	ρ	η		coulomb per cubic metre	C/m^3			
55	electric field strength	*E*	*K*		volt per metre	V/m			

(*Continued*)

TABLE 1 SYMBOLS FOR QUANTITIES AND THEIR UNITS — *Contd*

Item No	QUANTITIES				UNITS				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI unit		Some Other Units or Designations		Remarks
					Name	Symbol	Name	Symbol	
56	(electric) potential	V	φ, ϕ		volt	V			
57	potential difference, tension, voltage	U	V		volt	V			
58	electromotive force	E			volt	V			
59	electric flux	ψ			coulomb	C			
60	electric flux density, displacement	D			coulomb per square metre	C/m^2			
61	capacitance	C			farad	F			
62	permittivity, absolute permittivity (capacitivity)	$\varepsilon \epsilon$		for ε_0 see Table 2	farad per metre	F/m			
63	relative permittivity (relative capacitivity)	$\varepsilon_r, \epsilon_r$				1			

63a	electric susceptibility	K, K_e				1			
64	electrization	E_i	K_i	$E_i = (D/\varepsilon_0) - E$	**volt per metre**	**V/m**			
65	electric polarization	P	D_i	$P = D - \varepsilon_0 E$	**coulomb per square metre**	**C/m²**			
66	electric dipole moment	p	p_e		coulomb metre	**C. m**			
67	(electric) current	I			ampere	**A**			
68	current density	J	S		**ampere per square** metre	**A/m²**			
69	linear current density	A	a	current divided by width of the conducting sheet	**ampere per metre**	A/m			
70	magnetic field strength	H			**ampere per metre**	A/m	oersted	Oe	*see* Note 8
71	magnetic potential difference	U, U_m	$\mathcal{U}$		ampere	**A**			
72	magnetomotive force	F, F_m	$\mathcal{F}$	$F = \oint H_s\, ds$	**ampere**	**A**	ampere-turn **abbreviation at** **gilbert**	Gb	see Note 9 see Note 10
72a	current linkage	Θ		$\Theta = \int_A J_A\, dA$ when Θ is composed of N equal currents I. $\Theta = NI$. *The* names	**ampere**	**A**			

(*Continued*)

TABLE 1 SYMBOLS FOR QUANTITIES AND THEIR UNITS —*Contd*

ITEM NO	QUANTITIES				UNITS				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI units		Some Other Units or Designations		Remarks
					Name	Symbol	Name	Symbol	
				'ampere-turn' and 'number of ampere-turns for this quantity are deprecated					
73	magnetic flux density (magnetic induction)	*B*			tesla	T	gauss	Gs	see Note 1
74	magnetic flux	Φ			weber	Wb	maxwell	Mx	see Note 1
75	magnetic vector potential	*A*			weber per metre	Wb/m			
76	self inductance	*L*			henry	H			
77	mutual inductanc	*M*, L_{mn}			henry	H			
78	coupling coefficient	*k*		for example $k=L_{12}(L_1 L_2)^{-}$		1			
79	leakage coefficien	σ		$\sigma=1-k^2$		1			

80	permeability, absolute permeability	μ		for μ_0 see Table 2	henry per metre	H/m			
81	relative permeability	μ_r				1			
82	magnetic susceptibility	$\varkappa, K$	$\varkappa_m$			1			
83	magnetic moment (magnetic area moment)	m		the vector product of m and B is equal to the torque I;	ampere square metre	A.m²			-
84	magnetization	H_i, M		$H_i = (B/\mu_0) - H$	ampere per metre	A/m			-
85	intrinsic magnetic flux density, magnetic polarization	B_i, J		$B_i = B - \mu_0 H$	tesla	T			
86	magnetic dipole moment	j		$j = \mu_0 m$	newton square metre per ampere	N. m²/A			- -
87	resistance	R		*see* Item 93	ohm	Ω		-	-
88	resistivity	ρ		ohm metre	ohm metre	Ω.m		-	-
89	conductance	G			siemens	S	mho	mho	-
90	conductivity	γ, σ		$\gamma = 1/\rho$	siemens per metre	S/m		-	-
91	reluctance	R, R_m	$\mathcal{R}$		1 per henry	H^{-1}		-	-
92	permeance	Λ	P	$\lambda = 1/R_m$	henry	H		-	-

(Continued)

TABLE 1 SYMBOLS FOR QUANTITIES AND THEIR UNITS — *Contd*

ITEM No	QUANTITIES				UNITS				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI unit		Some Other Units or Designations		Remarks
					Name	Symbol	Name	Symbol	
93	impedance	Z		it is understood that the term impedance denotes in general a complex quantity, $Z=R+jX$	ohm	Ω			
94	reactance	X			ohm	Ω			
95	quality factor	Q				1			
96	loss angle	δ			radian	rad			
97	admittance	Y		$Y=1/Z$	siemens	S			
98	susceptance	B			siemens	S			
99	active power	P			watt	W			
100	reactive power	Q	P_q		var	var			
101	apparent power	S	P_s	$S^2=P^2+Q^2$	voltampere	VA			
101a	power factor	λ		$\lambda=P/S$ for the special case of sinusoidal voltage and current, $\lambda=\cos\varphi$		1			

101b	dissipation factor	d		$d = P/\sqrt{S^2 - P^2}$ for the special case of sinusoidal voltage and current, $d = \tan \delta$		1			
102	Poynting vector	**S**			watt per square metre	W/m^2			
103	phase difference, phase displacement	φ, ϕ	ϑ,		radian	rad			
104	number of turns in a winding	N				1			
104a	turns ratio	n	1	this may also be used for the transformation ratio of an ideal transformer: if two windings identified by a and b have the numbers of turns N_a and N_b, then $n_{ab} = N_a/N_b$. For power transformer, $n \geqslant 1$ by convention		1			
04b	transformation ratio of an instrument transformer	K				1			
104c	transformation ratio of a voltage transformer	K	K_U	$K_U = U_p/U_s$ under specified conditions		1			
104d	transformation ratio of a current transformer	K	K_I	$K_I = I_p/I_s$ under specified conditions		1			
105	number of phases	m				1			

(*Continued*)

TABLE **1** SYMBOLS FOR QUANTITIES AND THEIR UNITS —*Contd*

ITEM No.	QUANTITIES				UNITS				
	Name of Quantity	Chief Symbol	Reserve Symbol	Remarks	SI unit		Some Other Units or Designation		Remark
					Name	Symbol	Name	Symbol	
106	number of pairs of poles	p		p is sometimes used to indicate number of poles. Where ambiguity may occur, the intended meaning should be indicated		1			
Radiation									
107	radiant energy	Q, W	Q_e, U		joule	J			
108	radiant flux, radiant power	Φ, P	Φ_e		watt	W			
109	radiant intensity	I	I_e		watt per steradian	W/sr			
110	radiance	L	L_e		watt per steradian square metre	$\frac{W}{sr.m^2}$			
111	radiant existence	M	M_e		watt per square metre	W/m^2			
112	irradiance	E	E_e		watt per square metre	W/m^2			

Light									
113	luminous intensity	Z	I_V		candela	cd			
114	luminous flux	Φ	Φ_V		lumen	lm			
115	quantity of light	Q	Q_V		lumen second	lm.s			
116	luminance	L	L_V		candela per square metre	cd/m^2			
117	luminous exitance	M	M_V		lumen per square metre	lm/m^2		-	-
11%	illuminance, illumination	E	E_V		lux	lx			

Note 1 — 'rad' can be replaced by 'I'.

Note 2 — Item I7 and 20 represent the same physical phenomenon, which is known also under other names such as rotational speed, number of revolutions per unit time, and speed of rotation. This phenomenon is here expressed by two quantities, one of frequency character, n, Item 17, and the other of velocity character, ω, Item 20, with the relationship $\omega = n.2\pi$ rad.

On nameplates of rotating electrical machinery. r/min and r/s may be used as (international) symbols instead of **language** dependent abbreviations such as the English rev/min and rpm (revolutions per minute), rev/s, and rps (revolutions per second).

Note 3 — ISO (International Organization for Standardization) gives s^{-1}.

Note 4 — '1 per second' is the name of the unit in the form adopted by the General Conference **of** Weights and Measures (CGPM).

Note 5 – '1 per metre' is the name of the unit in the form adopted by the General Conference of Weights and Measures (CGPM).

Note 6 — For kilogram-force the name 'kilopond' with the abbreviation 'kp' is also used.

Note 7 — The degree Celsius is a temperature interval of one kelvin.

Note 8 — The oersted is the electromagnetic CGS unit.

Note 9 — ISO gives 'ampere-turn' as a remark.

Note 10 — The gilbert is the electromagnetic CGS unit.

Note 11 — The gauss is the electromagnetic CGS unit.

Note 12 — The maxwell is the electromagnetic CGS unit.

TABLE 2 SYMBOLS FOR CONSTANTS

ITEM No.	NAME OF CONSTANT	SYMBOL	VALUE	REMARK
201	speed of propagation of electro-magnetic waves in vacuo	c_0	(2·997 925 ± 0·000 001) × 10^8m/s	$\varepsilon_0\mu_0 = \frac{1}{c_0^2}$
202	standard acceleration of free fall	g_n	9·806 65 m/s^2	
203	elementary charge	e	(1·602 192 ± 0·000 07) × 10^{-19}C	
204	Planck constant	h	(6 626 20 ± 0·000 05) × 10^{-34} J.s $h = \frac{h}{2\pi}$ = (1·054 592 ± 0·000 008) × 10^{-34} J.s	
205	Boltzmann constant	k	(1·380 62 ± 0·000 06) × 10^{-23}J/K	
206	electric constant, permittivity (capacitivity) of vacuum	ε_0, ϵ_0	(8·854 185 ± 0·000 006) × 10^{-12} F/m	$\varepsilon_0\mu_0 = \frac{1}{c_0^2}$
207	magnetic constant, permeability of vacuum	μ_0	4π × 10^{-7} H/m=1·256 64×10^{-6} Hm	$\varepsilon_0\mu_0 = \frac{1}{c_0^2}$
208	Avogadro constant	N_A	(6·022 17 ± 0·000 12) × 10^{23} mol^{-1}	
209	Faraday constant	F	(9·648 67 ± 0·000 16) × 10^4 C/mol	$F = eN_A$
210	electron rest mass	m_e	(9·109 56 ± 0·000 05) × 10^{-31} kg	
211	Bohr magneton	μ_B	(9·274 10 ± 0·000 06) × 10^{-24} J/T	

TABLE 3 SOME MATHEMATICAL SIGNS AND SYMBOLS

Item No.	Name	Sign or Chief Symbol	Remarks
301	ordinary differential sign	d	
302	partial differential sign	∂	
303	sign of variation	δ	
304	increment sign	Δ	
305	summation sign	Σ	
306	product sign	Π	
307	base of natural logarithms	e	*e* is also used
308	ratio of circumference to diameter of a circle	π	$\pi = 3{\cdot}141\ 592\ 65......$
309	imaginary unity (imaginary unit)	j	$j^2 = -1$, *j* is also used
310	$\frac{2}{3}\pi$ rad rotative operator	a	$a = e^{j\frac{2\pi}{3}}$
311	cartesian co-ordinates	x, y, z	
312	cylindrical co-ordinates	ρ, φ, z ρ, Φ, z	$(ds)^2 = (d\rho)^2 + (\rho d\varphi)^2 + (dz)^2$
313	spherical co-ordinates	r, ϑ, φ r, θ, Φ	$(ds)^2 = (dr)^2 + (r d\vartheta)^2 + (r \sin \vartheta\, d_\varphi)^2$

TABLE 4 RECOMMENDED SUBSCRIPTS

ITEM No.	SUBJECT	SUBSCRIPT		
		Short Form	Long Form	Language Source (*see* **2.9**)
	Fields of Science or Technology			
0101	chemical	ch	chem	G
0102*	electric	e	el	G
0103*	energetic	e	en	G
0104*	magnetic	m	mag	G
0105	magnetizing	m	mag	G
0106*	mechanical	m	mec	G
0107	thermal	th, θ, ϑ	therm	G
0108*	luminous, visual	v	vis	L
0109	optical	opt		G
0110*	acoustical	a	ac	G
0111	radiation	r	rd	L
	Kind of Value of a Quantity			
0201	root-mean-square (value of a periodic quantity)	rms		L
0202	peak value	m		L
0203*	maximum (not in the sense o f peak value)	m	max	L
0204*	average (arithmatic mean value)	ar, av, moy		L (ar), L and E (av), F (moy)
0205	median	med		L

0206	minimum	min		L
0207	instantaneous	i	inst	L
0208	local	l	loc	L
0209	absolute	a	abs	L
0210†	relative	*, r	rel	L
0211	reference	ref		L
0212	error	e	er	L
0213*	deviation	d	dev	L
0214	correction	c	cor	L
	Waveform, Components and Signals			
0301	varying	v	var	L
0302	pulse	p	pul	L
0303	sinusoidal	sin		L
0304	resting, quiescent	q	qu	L
0305	transient	t	trt	L
0306*	alternating	∼, a	alt	L
0307*	direct	—, 0‡	(0)	
0308	Ist harmonic (fundamental)	1	(1)	
0309	2nd harmonic	2	(2)	
0310	nth harmonic	n	(n)	
0311	zero sequence component	0		
0312	positive sequence component	1		

*see Table 5, for illustrative examples.

†A numeric generated as the ratio of two quantities of the same kind may be represented either by a special symbol or by the symbol for the quantities of which the ratio is taken, with an asterisk or ‘ r ’ or ‘ ral ’ as subscript.

Example: $a/a_0 = a^* = a_r = a_{rel}$.

‡This is a zero, not the letter ‘ O ’.

(*Continued*)

TABLE 4 RECOMMENDED SUBSCRIPTS — *Contd*

ITEM No.	SUBJECT	SUBSCRIPT		
		Short Form	Long Form	Language Source
0313	negative sequence component	2		
0314	resonance	r	rsn	L
0315	signal	s	sig	L
0316	distortion	d	dist	L
0317	modulation	mod		L
0318	demodulation	dem		L
	Relationship			
0401*	additional	a	ad	L
0402	residual	r	rsd	L
0403*	resulting	r	rsl	L
0404	total	t	tot	L
0405	sum	Σ	sum	L
0406†	difference	△, d	dif	L
0407†	differential	d		L
0408	equivalent	e	eq	L
0409	synchronous, synchronizing	s	syn	G
0410	asynchronous	as	asyn	G
0411	time	t		L
0412	simultaneous	sim		L
0413	successive	suc		L
0414	lower, low	b, i	inf	C (b), L (i)

0415	upper, high	h, s	sup	E and F (h), L (s)
0416	self	p	prop	L
0417	mutual	m	mut	L
0418	induced	i	ind, indu	L
0419*	direct	d	dir	L
0420*	indirect	ind	indir	L

Geometric Conditions

0501	axial	a	ax	L
0502	radial	r	rad	L
0503	tangential	t	tan	L
0504	longitudinal	l	long	L
0505*	direct (for example, axis in electrical machine theory)	d		L
0506	transverse	t	trv	L
0507	quadrature (phase)	q	qua	L
0508	quadrature (axis)	q	qua	L
0509	parallel	∥, p	par	G
0510*	perpendicular, normal	⊥, n	perp	L
0511	spherical	○, s	sph	G
0512	hemispherical	◡ ⌓, h	hsph	G
0513*	ambient	a	amb	L

*See Table 5, for illustrative examples.

†When, in the same context difference and differential are used, ambiguity can be avoided by using '△' for difference and '*d*' for differential.

(*Continued*)

l SCRIPTS — *Contd*AMENDED SUB:ABLE 4 RECON T.

›UBSCRIPT			Ş	UBJECT	S	ITEM No.	
Language Source	Long Form	ıort Form		Sł			
L	t		**ex**	**e**	**·rnal**	0514	exte
L			**loc**	1	1	0515	**loca**
L			**int**	i	rnal	0516	inte:
L			str	**s**	**or**	**0517***	**state**
L	t		roi	r	r	0518	**roto**
			t	δ	n magnetic **circuigap** or other gap i	**0519***	air g
		Value Refers	**on to Which the**		**The Situati**		
L			id	i	**l**	0601	idea
L	**m**		**no**:e)	N	se of limiting valud (*not* in the senr	0602	rate
L	rm		**no**ue or with	n	leaning usual valmal (with the m rdized value) le meaning **standa**	0603	nor* th
G	**:or**		**the**	th	**oretical**	0604	**theo**
L			re	r	(true)	0605	real
L	**:s**		**me**	m	sured	**0606***	mea
L				exp	**erimental**	**0607***	**expe**
L	**.c**		cal	**c**	ulated	**0608***	**calc**
G	, char		**ch,**	**0†,** c	**acteristic**	0609	char
L	i		:n i	**0†, i**	al	0610	initi
L			**fin**	f		0611	final
L				t		0612	**time**
				w	*ifinity*	0613	at *in*

0614’	stationary condition, steady state	**s, st**	stat	L
0615	original	or		L
0616*	critical	c, cr	**crit**	G
0617	intrinsic	i	intr	L
0618	vacuum	**0†,** v	**vac**	L
0619	regular	r	**reg**	L
0620	diffuse	d	dfu	L
0621	useful	**u**	Llt	L
0622	loss dissipation	d	diss	L
0623f	effective (not in the sense of root-mean-square)	e	ef	L
0624	static	**s,** st	stat	L
0625	dynamic	d	dyn	G
		Circuits		
0701	in, input	1, in, i		L
0702	out, output	**2,** ex, **0†**		L **(ex), E (o)**
0703	primary	**1, p**	prim	L
0704	secondary	2, **s**	**sec**	L
0705	tertiary	3	ter	L
0706§	short-circuit	k	cc, SC	G (k), L and **F** (cc). E (sc)
0707	open circuit	**0†**	oc	E, F
0708	series	**s**	ser	L
0709	shunt, parallel	P	par	G

*see Table 5, for illustrative examples.

†This is a zero, not the letter ‘o’.

‡*see* Item No. 0201.

§The single subscript is used in semiconductor work. where *c* represents collector.

(*Continued*)

TABLE 4 RECOMMENDED SUBSCRIPTS — *Contd*

ITEM No.	SUBJECT	SUBSCRIPT		
		Short Form	Long Form	Language Source
	Semiconductors and Tubes			
0801	anode	a		G
0802	base	b		G
0803	collector	c		L
0804	emitter	e		L
0805	heater, filament	f		L
0806	grid	g	gr	**E,** F
0807	gate	g	ga	**E,** F
0808	cathode	k		G

TABLE 5 **ILLUSTRATIVE** EXAMPLES

ITEM No.	SUBJECT	EXAMPLES
0102	electric energy	$W_{e,\ el}$
0104	magnetic energy	W_{mag}
0106	mechanical energy	W_{mec}
0103	radiance	L_{e}*
0108	luminance	L_{v}*
0110	acoustical resistance	R_{a}*
0401	additional resistance	R_{a}, R_{ad}
0616	critical velocity	v_{c}, v_{er}, v_{erit}
0608	calculated velocity	V_{c}, V_{calc}
0606	measured velocity	u_{m}, u_{mes}
0203	maximum velocity	u_{max}
0204	mean velocity	v, Uav
0614	steady-state temperature	t_{s}, t_{st}, t_{stat}
0513	ambient temperature	t_{amb}
0517	stator temperature	t_{s}, t_{st}, t_{str}
0213	deviation angle	α_{d}, α_{dev}
0519	air-gap reluctance	$R_{m\delta}$

*There is no alternative subscript, since this entire symbol has been standardized.

APPENDIX A

ALPHABATICAL LIST OF SYMBOLS FOR QUANTITIES AND. FOR CONSTANTS MENTIONED IN TABLES 1 AND 2

SYMBOL	ITEM NUMBER IN TABLES 1 (QUANTITIES) AND 2 (CONSTANTS)
a	24
A	11, 40, 69, 75
b	4, 28
B	73, 83, 84, 85, 98
B_1	85
c	22, 23, 51
c_0	23,201, 206, 207
C	50, 61
d	6, 8, 101b
D	60, 64, 65
D_1	65'
e	203
E	41, 55, 58, 64, 65, 112, 118
E_e	112
E_1	64
E_v	118
f	16, 19
F	34, 72
F_m	72
$\mathcal{F}$	72
F	209
g	18, 25
g_n	202
G	35, 89
h	5, 204
	204
H	70, 84, 85, 86
H_1	84
H_s	72
Z	33, 67, 109, 113
I_e	109
I_v	113
j	86
J	33, 68, 85
k	55, 78, 79, 205
K	64
K_1	
I	3
L	76, 110, 116
L_e	110
L_{mn}	77
L_v	116

SYMBOL	ITEM NUMBER IN TABLE 1 (QUANTITIES) AND 2 (CONSTANTS)
m	30, 83, 105
m_e	210
M	37, 77, 84, 111. 117
M_e	111
M_v	117
n	17, 104a
N	104
N_A	208
P	29, 32, 39. 66,106
p_e	66
P	35, 43, 65, 92, 99, 100, 101, 108
P_q	100
P_s	101
q	104a
Q	47, 52, 95, 100, 101, 107, 115
Q_e	107
Q_v	115
r	7
R	87 91 93
R_m	91: 92'
$\mathcal{R}$	91
s	9, 18, 72
S	11, 68, 101, 102
t	13, 24, 46
T	14, 15, 38, 45, 83, 86
u	22
U	41, 57, 71, 107
U_m	71
$\mathcal{U}$	71
v	12, 22, 24
V	12, 56, 57
w	22, 42
W	35, 40, 41, 107
X	93, 94
Y	97
Z	93, 97
α	1, 21, 27, 29, 48, 69
β	1, 28, 29, 48
Y	1, 29, 36. 48, 90
δ	6, 26, 96
ε, $\in$	62
ε_0, $\in_0$	62, 64, 65,201, 206, 207
ε_r, $\in_r$	63

(*Continued*)

SYMBOL	ITEM NUMBER IN TABLE (QUANTITIES) AND 2 (CONSTANTS)	SYMBOL	ITEM NUMBER IN TABLE 1 (QUANTITIES) AND 2 (CONSTANTS)
η	44, 54	τ	15
ϑ, θ	46, 103	φ, ϕ	56, 103
Θ	45	Φ	74, 108, 114
$\varkappa$, κ	78, 82	Φ_e	108
λ	10, 49	Φ_v	114
Λ	92	K	63a
μ	80	K_e	63a
μ_0	80, 84, 85, 201, 206, 207	K_m	82
μ_r	81	φ	59
ν	16	ω	2, 19, 20
ρ	31, 54, 88, 90	Ω	2, 20
σ	53, 79, 90		

APPENDIX B

ALPHABETICAL LIST OF SYMBOLS FOR UNITS MENTIONED IN TABLE 1

SYMBOL	ITEM NUMBER IN TABLE 1	SYMBOL	ITEM NUMBER IN TABLE 1
A	67, 71, 72	m^1	27, 28, 29
Ah	52	m^2	11
A.m^2	83	m^3	12
A/m	69, 70, 84	mho	89
A/m^2	68	m/s	22, 23
At	72	m/s^2	24, 25
bar	39	min	13
c/s	16	Mx	74
cd	113	N	34, 35
cd/m^2	116	N.m	37, 38
C	52, 59	N/m^3	36
C.m	66	N.m^2/A	86
C/m^2	53, 60, 65	Oe	70
C/m^3	54	Pa	39
dyn	34, 35	rad	19, 20
erg	41	rad/s	1, 96
ev	41	rad/s^2	21
F	61	r/min	17
F/m	62	r/s	17
Gb	72	s	13, 14, 15
Gs	73	s^{-1}	16, 17, 19, 26
h	13	sr	2
H	76, 77, 92	S	89, 97, 98
H^{-1}	91	S/m	90
H/m	80	T	73, 85
Hz	16, 17	var	100
J	40, 41, 47, 107	V	56, 57, 58
J/ (kg.k)	51	V/m	55, 64
J/K	50	VA	101
J/m^3	42	W	43, 99, 108
kg	30	W/m^2	102, 11, 112
kg.m^2	33	W/(m.K)	49
kg/m^3	31	W/sr	109
kg.m/s	32	W/(sr.m^2)	110
kgf	34, 35	Wb	74
Kp	34, 35	Wb.m	86
kWh	41	Wb/m	75
K	45	Ω	87, 93, 94
K^{-1}	48	Ω.m	88
lm	114	...°	1
lm.s	115	...′	1
lm/m^2	117	...″	1
lx	118	°C	46
m	3, 4, 5, 6, 7, 8, 9, 10	%	18, 44

APPENDIX C

ALPHABETICAL LIST OF NAMES OF QUANTITIES AND CONSTANTS MENTIONED IN TABLES 1 AND 2

NAME	ITEM NUMBER IN TABLES 1 (QUANTITIES) AND 2 (CONSTANTS)
absolute permeability	80
absolute permittivity	62
absolute temperature	45
acceleration	24
acceleration due to gravity	25
acceleration of free fall	25, 35
active power	99
admittance	97
angle	1
angular acceleration	21
angular frequency	19
angular velocity	17, 20
apparent power	101
area	11
attenuation coefficient	27
Avogadro constant	208
black body radiation	41
bohr **magneton**	211
Boltzmann constant	205
breadth	4
capacitance	61
capacitivity	62
Celsius temperature	46
charge	52
charge density	54
conductance	89
conductivity	90
coupling coefficient	78
cubic expansion (temperature) coefficient	48
current	67, 69
current density	68
damping coefficient	26
density	31
depth	5
diameter	8
displacement	60
dissipation factor	101b
dynamic moment of inertia	33
efficiency	44
electric charge	52
electric constant	206
electric current	67
electric dipole moment	66
electric field strength	55
electric flux	59
electric flux density	60
electric polarization	65
electric potential	56
electric susceptibility	63a
electrization	64
electromagnetic moment	83
electromotive force	58
electron rest mass	210
elementary charge	203
energy	41
energy (volume) density	42
Faradav constant	209
flux of displacement	59
force	34
frequency	16
heat	47

NAME	ITEM NUMBER IN TABLES 1 (QUANTITIES) AND 2 (CONSTANTS)
heat capacity	50, 51
height	5
illuminance	118
impedance	93
internal energy	41
intrinsic magnetic flux density	85
irradiance	112
leakage coefficient	79
length	3
length of path	9
line segment	9
linear acceleration	24
linear current density	69
loss angle	96
luminance	116
luminous exitance	117
luminous flux	114
luminous intensity	113
mass	30, 31, 32, 51
mass density	31
magnetic area moment	83
magnetic constant	207
magnetic dipole moment	86
magnetic field strength	70
magnetic flux	74
magnetic flux density	73
magnetic induction	73
magnetic moment	83
magnetic polarization	85
magnetic potenial difference	71
magnetic susceptibility	82
magnetic vector potential	75
magnetization	84
magnetomotive force	72
moment of a couple	38
moment of force	37
moment of inertia	33
momentum	32
mutual inductance	77
number of pairs of poles	106
number of phases	105
number of revolutions per time	17
number of turns in a winding	104
period	14
permeability	80
permeability of vacuum	207
permeance	92
permittivity	62
permittivity of vacuum	206
phase coefficient	28
phase difference	103
phase displacement	103
planck constant	204
plane angle	1
potential	56
potential difference	57
power	43
power factor	101a
Poynting vector	102
pressure	39
pressure (temperature) coefficient	48
propagation coefficient	29
quality factor	95
quantity of electricity	52
quantity of heat	47
quantity of light	115
radial distance	7
radiance	110
radiant exitance	111
radiant energy	107

NAME	ITEM NUMBER IN TABLES 1 (QUANTITIES) AND 2 (CONSTANTS)
radiant flux	108
radiant intensity	109
radiant power	108
radius	7
reactance	94
reactive power	100
relative permeability	81
relative permittivity	63
reluctance	91
resistance	87
resistivity	88
rotational frequency	17
self inductance	76
slip	18
solid angle	2
specific heat	51
specific heat capacity	51
specific weight	36
speed (linear)	22
speed of propagation of electromagnetic waves	23
speed of propagation of electromagnetic waves in vacuo	201
speed of rotation	17
standard acceleration of free fall	202
surface area	11

NAME	ITEM NUMBER IN TABLE 1 (QUANTITIES) AND 2 (CONSTANTS)
surface density of charge	53
susceptance	98
temperature	46
temperature coefficient	48
tension	57
thermal conductivity	49
thermodynamic temperature	45
thickness	6
time	13
time constant	15
time of one cycle	14
torque	38
turns ratio	104a
velocity	22, 32
velocity of propagation of electromagnetic waves	23
voltage	57
volume	12, 31, 36
volume density of charge	54
wavelength	10
weight	35, 36
weight density	36
width	69
work	40

APPENDIX D

ALPHABETICAL LIST OF SUBSCRIPTS IN TABLE 4

SUBSCRIPT	ITEM NUMBER
a	0110, 0209, 0306, 0401, 0501, 0513, 0801
abs	0209
ac	0110
ad	0401
alt	0306
amb	0513
ar	0204
as	0410
asyn	0410
av	0204
ax	0501
b	0414, 0802
c	0214, 0608, 0609, 0616, 0803
calc	0608
cc	0706
ch	0101, 0609
char	0609
chem	0101
cor	0214
cr	0616
crit	0616
d	0213, 0316, 0406, 0407, 0419, 0505, 0620, 0622, 0625
dem	0318
dev	0213
dfu	0620
dif	0406
dir	0419
diss	0622
dist	0316
dyn	0625
e	0102, 0103, 0212, 0408, 0514, 0623, 0804
ef	0623
eff	0201
el	0102
en	0103
eq	0408
er	0212
ex	0702
exp	0607
ext	0514
f	0611, 0805
fin	0611
g	0806, 0807
ga	0807
gr	0806
h	0415, 0512
hsph	0512
i	0207, 0414, 0418, 0516, 0601, 0610, 0617, 0701
id	0601
in	0701
ind	0418, 0420
indir	0420
indu	0418
inf	0414
ini	0610
inst	0207
int	0516
intr	0617
k	0706, 0808
l	0208, 0504, 0515
loc	0208, 0515
long	0504
m	0104, 0105, 0106, 0202, 0203, 0417, 0606
mag	0104, 0105
max	0203
mec	0106
med	0205
mes	0606
min	0206

SUBSCRIPT	ITEM NUMBER
mod	0317
moy	0204
mut	0417
n	0310, 0510, 0603
(n)	0310
nom	0602
norm	0603
N	0602
o	0702, 0707
oc	0707
opt	0109
or	0615
p	0302, 0416, 0509, 0703, 0709
par	0509, 0709
perp	0510
prim	0703
prop	0416
pul	0302
q	0304, 0507, 0508
qu	0304
qua	0507, 0508
r	0111, 0210, 0314, 0402, 0403, 0502, 0518, 0605, 0619
rad	0502
rd	0111
re	0605
ref	0211
reg	0619
rel	0210
rms	0201
rot	0518
rsd	0402
rsl	0403
rsn	0314
s	0315, 0409, 0415, 0511, 0517, 0614, 0624, 0704, 0708
sc	0706
sec	0704
ser	0708
seg	0315
sim	0412
sin	0303
sph	0511
st	0614, 0624
stat	0614, 0624
str	0517
suc	0413
sum	0405
sup	0415
syn	0409
t	0305, 0404, 0411, 0503, 0506, 0612
tan	0503
ter	0705
th	0107, 0604
theor	0604
therm	0107
tot	0404
trt	0305
trv	0506
u	0621
ut	0621
v	0108, 0301, 0618
vac	0618
var	0301
vis	0108
δ	0519
Δ	0406
θ	0107
Σ	0405
0	0307, 0311, 0609, 0610, 0618
(0)	0307
1	0308, 0312, 0701, 0703
(1)	0308
2	0309, 0313, 0702, 0704
(2)	0309
3	0705
*	0210
$\sim$	0306
—	0307
$\parallel$, p	0509
$\perp$, n	0510
○, s	0511
◠, h	0512
◡, h	0512
∞	0613

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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